

**A NEW SPECIES OF *PTEROPTRIX*
(HYMENOPTERA: APHELINIDAE)
FROM ARGENTINA, THE FIRST KNOWN APHELINID
WITH THREE-SEGMENTED TARSI¹**

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ABSTRACT: A new species of aphelinid wasp, *Pteroptrix fidalgoi*, is described and illustrated from a single female collected in the Province of Misiones, Argentina. This is the first known representative of the family Aphelinidae with three tarsal segments. The reduction in number of tarsal segments in Chalcidoidea is briefly discussed.

KEY WORDS: *Pteroptrix fidalgoi*, Hymenoptera, Aphelinidae, Argentina, three-segmented tarsi.

Trichogrammatidae are defined primarily by having three-segmented tarsi, and secondarily by the antennal structure, usually S-shaped wing venation, a broadly jointed petiole, and a short and straight protibial spur. Among Chalcidoidea, three-segmented tarsi occur in Agaonidae and Eulophidae (Delvare and LaSalle 2000), and also in Mymaridae (Huber and Beardsley 2000). A new species described in this paper has three-segmented tarsi and a broad petiole similar to Trichogrammatidae. However, it clearly belongs to Aphelinidae based on antennal characteristics, structure of the mesosoma and wing venation, and the presence of a curved and bifid protibial spur.

This unusual specimen of *Pteroptrix* Westwood (Aphelinidae: Coccophaginae) was collected by Patricio Fidalgo in Loreto, Misiones, Argentina, which is the type locality of many Argentinean Hymenoptera collected by the late Alejandro A. Ogloblin. All previously known species of *Pteroptrix* have four tarsal segments. Other than having three-segmented tarsi, this specimen appears to be a normal *Pteroptrix*; it has no indications that it could be an aberrant form. The new species would key to *Pteroptrix* (= *Archenomus* Howard according to Hayat 1983) if we assume that it has four-segmented tarsi.

Generic placement of this species in Aphelinidae relies mainly on the antennal and tarsal segmentation, as well as on the presence or absence of a linea calva on the forewing (Hayat 1983, 1994). However, taxa with similar morphology, but with different segmentation of the antenna or tarsi, can be placed in separate genera without knowing their true affinities. For example, possible affinities of *Bardylis* Howard to *Coccophagoides* Girault and *Pteroptrix* to *Encarsia* Foerster have been suggested despite differences in the number of tarsal segments (see discussion of Hayat 1998). Furthermore, few studies have addressed the relationships of *Pteroptrix* and related genera (Prinsloo and Nesar 1990, Viggiani and Garonna 1993). Without convincing characters for supporting *Pteroptrix*, the monophyly of this genus cannot be assumed. We provisionally place the new

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species into *Pteroptrix*, assuming that the 3-segmented tarsi have no distinguishing phylogenetic value. We do not attempt to assess the delimitation of *Pteroptrix*, which would require a study of the large number of species groups and a rigorous phylogenetic analysis. Additionally, a single individual specimen makes it difficult to judge the phylogenetic significance of the new species. The supporting characters for its generic placement are as follows: one seta on the submarginal vein, costal cell longer than marginal vein, and mesotibial spur longer than mesobasitarsus (Table 1). While these are diagnostic features of *Pteroptrix* (Vigiani and Garonna 1993), unfortunately these characters evidently overlap with some other genera. As far as we know, there is no single character that supports the monophyly of *Pteroptrix* other than having all tarsi with a reduced number of segments (four-segmented). Only the combination of character states indicated in Table 1, including this single species with three-segmented tarsi, can be used to define *Pteroptrix*. Additionally, this specimen has a long and slender 'socketed peg-like structure' on the mandible similar to other *Pteroptrix* (Fig. 11, in Heraty and Schauff 1998).

The fauna of *Pteroptrix* in the Neotropical region is poorly known, with only three species recorded to date: *P. bicolor* (Howard) and *P. dimidiata* Westwood, both from Argentina, and *P. howardi* (Dozier) from Haiti and Puerto Rico (Noyes 1998).

Terms for morphological features used in the description follow those of Gibson (1997). Measurements are given in micrometers (μm) as length or, if applicable, as length/width. Explanations of measurements follow Hayat (1998). An abbreviation "F" is used: F = funicle segment.

Genus *Pteroptrix* Westwood, 1833

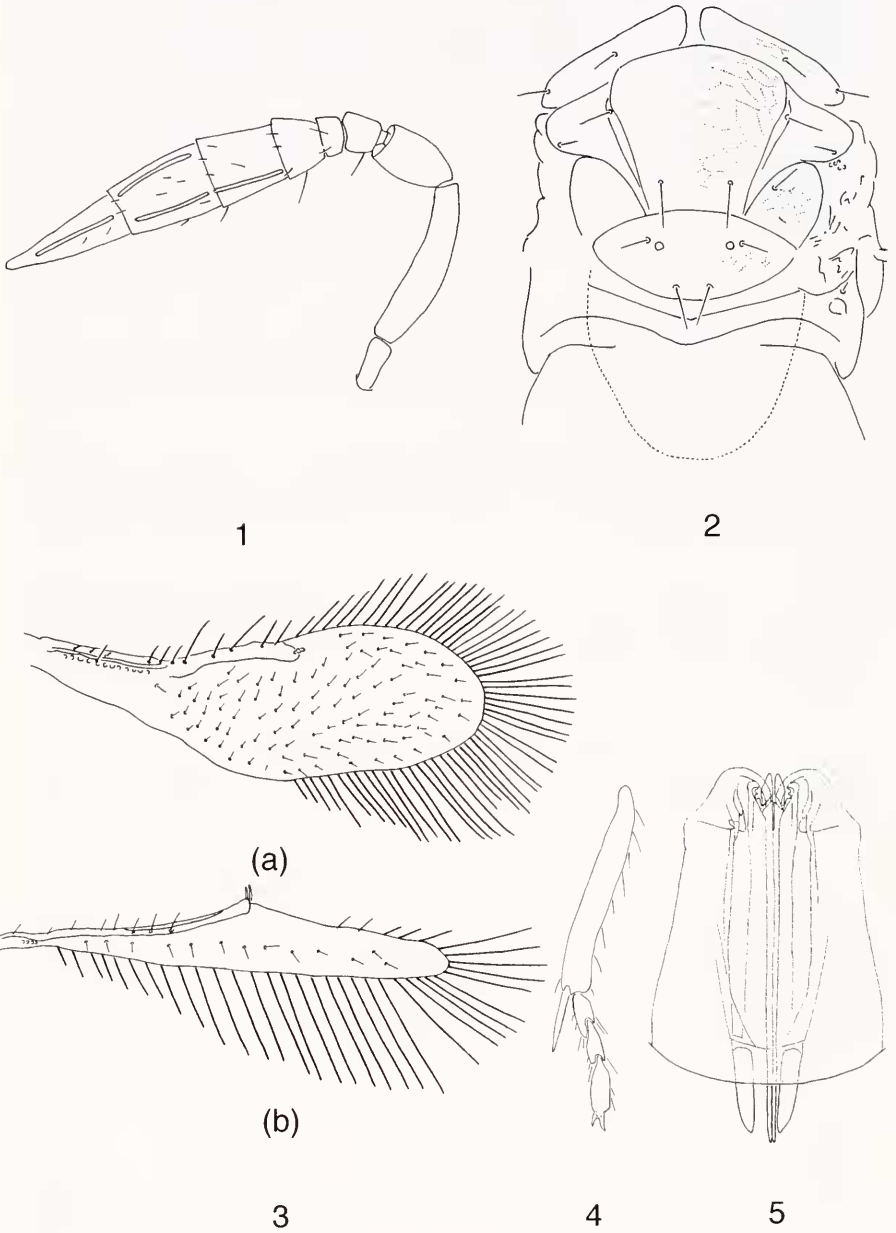
Pteroptrix Westwood, 1833: 344. Type species: *Pteroptrix dimidiatus* Westwood, 1833: 344, by monotypy.

Pteroptrix fidalgoi Kim & Triapitsyn, NEW SPECIES (Figs. 1-5)

Description. Female (holotype). Color. Body and appendages brown except following parts differently colored: face, vertex, and head above occipital suture orange; antenna dusky orange; side lobe and posterior and lateral parts of midlobe of mesoscutum orange; scutellum white; trochanters, protibia, apical third of mesotibia, apical half of metatibia, and tarsi orange. Wings hyaline except forewing blade slightly infuscated below venation, more so below marginal vein; venation brown.

Head. Head width 1.5 x of frontovertex width; eye length about 1.5 x as long as malar space; torulus below lower margin of eye; distance from torulus to eye margin 4 x diameter of torulus; a transverse sulcus on the posterior of the head. Mandible tetradentate, teeth very small; a long and slender, socketed, peg-like structure present.

Antenna (Fig. 1). 8-segmented, sparsely setose; flagellum spindle-shaped. Scape 5 x as long as broad; pedicel longer than combined lengths of F1 and F2; both F1 and F2 broader than long, F1 1.6 x longer than F2, F2 0.5 x as long as F3, F3 0.6 x as wide as F3, F3 appears to be part of clava rather than of funicle; length of two basal segments of clava as long as scape, basal segment of clava slightly longer than wide, two following segments notably longer than wide, distal segment of clava tapered at apex; funicle segments with 1 or 2 short longitudinal sensilla each; all three segments of clava with longitudinal sensilla each.



Figs. 1-5. Female of *Pteroptrix fidalgoi*, new species: (1) antenna; (2) mesosoma; (3) wings; (4) mesotibia and mesotarsus; (5) ovipositor.

Mesosoma (Fig. 2). Pronotum divided medially, each lobe with cellulate sculpture and 3 setae. Mesoscutum and scutellum with irregular cellulate reticulation. Mesoscutum much longer than scutellum; midlobe of mesoscutum with 2 pairs of setae, side lobe with 1 seta; axilla strongly projected forward into side lobe of mesoscutum, slightly longer than wide, with 1 seta. Distance from scutellar placoid sensillum to anterior seta less than its diameter; posterior pair of scutellar setae much closer to each other than are the anterior setae. Metanotum and propodeum short and smooth appearing.

Wings (Fig. 3). Forewing (Fig. 3a) 5.6 x as long as broad; submarginal vein with 1 seta; costal cell with 3 setae medially and 2 longer setae apically; marginal vein 0.8 x length of costal cell, with 6 strong setae on anterior margin. Chaetotaxy of blade irregular, with a small bare area apical to stigmal vein. Longest marginal cilia 0.8 x as long as greatest width of wing, marginal cilia on apical quarter of forewing more or less of same length. Hind wing (Fig. 3b) 7 x as long as broad; blade with a irregular row of microtrichia; longest marginal cilia about 1.8 x as long as greatest width of wing.

Legs. All tarsi 3-segmented. Mesotibial spur markedly longer than basitarsus (Fig. 4).

Metasoma. Ovipositor (Fig. 5) 1.7 x as long as mesotibia, about 4 x as long as third valvula; slightly exerted beyond apex of metasoma; external plate of ovipositor with 1 basal seta and 2 distal setae.

Measurements. Body (length, without head): 582. Head (width): 193. Antenna: scape: 84; pedicel: 44; F1: 18; F2: 11; F3: 22; clava: 157. Mesosoma (length): 215. Forewing (length/width): 455/82; longest marginal cilia: 109. Hind wing (length/width): 365/51; longest marginal cilia: 91. Legs (femur, tibia, tarsus): foreleg: 117, 91, 99; middle leg: 120, 146, 91; hind leg: 110, 153, 99. Metasoma: 368; ovipositor: 248.

Male. Unknown.

Type Material. Holotype female on slide: Argentina, Misiones, Loreto, 23.viii.2000, P. Fidalgo, YPT [yellow pan trap] in Ruinas Jesuíticas [deposited in the collection of Fundación e Instituto Miguel Lillo, San Miguel de Tucumán, Argentina (IMLA)].

Etymology. The new species is named after the collector, Dr. Patricio Fidalgo.

Distribution. Known only from the type locality in the Province of Misiones, Argentina.

Host. Unknown.

Comments. The new species is unique among *Pteroptrix* which otherwise have four tarsal segments. It has a tetradentate rather than tridentate mandible. *P. fidalgoi* new species is similar to the species from the *lauri* group as defined by Viggiani and Garonna (1993) based on mainly the shape of the antenna and the forewing, but that species group has the mesotibial spur shorter than the mesobasitarsus. The *incolus* group, suggested by Prinsloo and Nesar (1990) for *Archenomus* and later incorporated in the *maritima* group of *Pteroptrix* by Viggiani and Garonna (1993), appears to be related to *P. fidalgoi* based on the presence of a transverse sulcus on the posterior of the head. However, the unique three-segmented tarsi prevent the placement of the new species in any of the presently recognized species groups (Viggiani and Garonna 1993). Currently, the monophyly of each of the five existing species groups of *Pteroptrix* is not well defined and we choose not to place this new species into a species group.

Table 1. Comparison of morphological characters in *P. fidalgoi* new species, other *Pteroptrix* species, and related genera.

Taxon	No. of tarsal segments	No. of antennal segments	Shape of flagellum	No. of setae on SMV	Relative length of CC to MV	Relative length of MTS to MT	T VII	MTT	Stigmal vein
<i>P. fidalgoi</i>	3-3-3	8	Spindle-shaped	1	CC>MV	MTS>MT	Typical	4	Non-expanded apex
Other <i>Pteroptrix</i>	4-4-4	7/8	Spindle-shaped/ cylindrical	1/2/4	CC>>MV	MTS≥MT	Typical	1, 3, or 2+1	Non-expanded apex
<i>Bardalis</i>	4-4-4	7	Cylindrical	1	CC>>MV	MTS<MT	Band-like	2+1	Non-expanded apex
<i>Coccophagoides</i>	5-5-5	8	Spindle-shaped/ cylindrical	>3	CC>>MV	MTS≥MT	Band-like	2+1	Expanded apex
<i>Encarsia</i> *	5-5(+4)-5	8	Cylindrical	2 (rarely 1/3/5)	CC≤MV	MTS<MT	Typical	2+1	Non-expanded apex

CC: costal cell; MT: mesobasitarsus; MTS: mesofibial spur; MTT: mandible teeth (teeth number of teeth number + truncation); MV: marginal vein; SMV: submarginal vein; T VII: gastral tergum VII (typical one, see Fig. 6 in Hayat (1998); band-like, see Fig. 8 in Hayat (1994), and Figs. 28 and 112 in Hayat (1983)).

**Dirphys* Howard and *Encarsia* Hayat, related to *Encarsia*, are not included in the table. These two genera form a trichotomy with *Encarsia*, but they remain valid to preserve important diagnostic information (Polaszek and Hayat 1992).

DISCUSSION

The reduction of tarsal segments in Chalcidoidea is a phenomenon that is still poorly understood. In the Mymaridae, for instance, tarsomere number has been used in the past to subdivide the family into subfamilies and tribes; however, apparently closely related genera such as *Camptoptera* Foerster (tarsi five-segmented) and *Eufoersteria* Mathot (tarsi four-segmented, two apical tarsomeres likely fused) would end up in different subfamilies if only this character is considered. As Huber and Lin (1999, p. 38) wrote, "Reduction in tarsomere number from 5 to 4 has likely occurred several times in Mymaridae... Clearly, loss or perhaps fusion of segments, whether antennal or tarsal, occurs much more frequently than previously realized, necessitating a re-evaluation of generic limits in several groups. Unfortunately, in the past, too much reliance was placed on the number and constancy of appendage segments for defining genera, with the result that several genera, not only in the *Camptoptera* group, are too narrowly defined."

We fully agree with the above quote and believe that the recent discoveries of non-trichogrammatid Chalcidoidea with three-segmented tarsi, such as the genus *Trisecodes* Delvare and LaSalle (Eulophidae: Entedoninae) (Delvare and LaSalle 2000), as well as this new species of *Pteroptrix*, further support the necessity of reconsidering the practice of using appendage segmentation as the sole or main basis for definition of some groups.

In some groups of Chalcidoidea, reductions in the number of appendage segments may be associated with the adaptations for parasitization of smaller hosts. For instance, in species of the mymarid genus *Erythmelus* Enoch, which are parasitoids of eggs of Tingidae, a reduction of funicle segments from six to five is rather common. This may be due either to the outright loss of a segment or to the fusion of any two neighboring segments (S. V. Triapitsyn, unpublished data). Furthermore, the funicle of one species of *Erythmelus* is four-segmented due to a further fusion of two segments following the initial loss of a funicle segment (Triapitsyn and Fidalgo 2001).

Parasitoids of armored scales (Diaspididae) sometimes have a reduced number of tarsal segments when compared with taxa from the same family that parasitize different, and often larger, hosts. For instance, two of the three known genera of Encyrtidae that have four-segmented tarsi, *Anthemus* Howard and *Arrhenophagus* Aurivillius (the other is *Tetracyclos* Kryger, probably parasitizing Pseudococcidae), belong to two different tribes; both are minute in size and both are parasitoids of Diaspididae.

As noted above, occasional reductions in the number of tarsal and especially funicle segments in Chalcidoidea may occur independently, and are not necessarily the result of a single event. There are three genera of Aphelinidae with a 4-4-4 tarsal formula: *Eretmocerus* Haldeman, *Bardylis*, and *Pteroptrix*. *Bardylis* and *Pteroptrix* are morphologically similar to *Coccophagoides* and *Encarsia* respectively, and both have been separated from similar genera based on the

tarsal segmentation. Hayat (1998) noted the striking similarity between *Pteroptrix* and *Encarsia*, especially the *citrina* species group of *Encarsia* (formerly *Aspidiotiphagus* Howard, all tarsi five-segmented, parasitic on Diaspididae). Additionally, the number of tarsal segments separates tetramerous *Bardylis* from pentamerous *Coccophagoides* despite their possible affinity and similarity (Hayat 1998). However, correlation of host size and segment reduction is not clear. The most widely used hosts of Aphelinidae are various Diaspididae and Aleyrodidae (Hayat 1998). These hosts are utilized by various aphelinid genera with either non-reduced or reduced tarsal and antennal segmentation. Without a careful study of the characters of the above genera, it is questionable whether the biology of parasitism on Diaspididae and a possible correlation with the reductions in some characters can be used to support the grouping. For example, the monophyly of the Diaspididae-parasitizing species of *Encarsia* was not supported by morphological and molecular analyses and they were scattered in three different places on the phylogenetic tree (Babcock *et al.* 2001).

Nevertheless, reduction of tarsal segmentation within *Encarsia* has been shown to be phylogenetically informative (Babcock *et al.* 2001). For example, the monophyly of the *luteola* group (parasitoids on Aleyrodidae) of *Encarsia*, with a four-segmented mesotarsus, was strongly supported (Babcock *et al.* 2001). The phylogenetically informative reduction in this species group is in direct contrast to the idea that four-segmented tarsi could have evolved multiple times and could not be informative in Aphelinidae. At the generic level, however, reduction of tarsal segments has not always proven to be informative within this family. Due to inconclusive and putative relationships among Aphelinidae based on different number of tarsal segments, reduction cannot be used by itself to justify designation of a new genus for this new species.

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